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ABSTRACT

Noting that readability formulas are strictly text-based and therefore do not reflect the interactive nature of the reading process, this paper argues that many of the instructional material evaluations for which such formulas are used are inappropriate and offers more reader-based alternatives to the use of formulas. The first half of the paper explores the history, purpose and characteristics of several popular readability formulas: Dale-Chall formula, Fry Graph, and the Spache formula. The second half then presents both text-based and reader/text-based alternatives to such formulas that allow the user to focus attention on factors involved in comprehension. This section also discusses appropriate uses for formulas and the alternatives. (HTH)

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Assessing Readability: Formulas and Alternatives

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ABSTRACT

Assessing Readability: Formulas and Alternatives

It is inappropriate to use readability formulas for purposes other than to obtain "ballpark" estimates of the appropriateness of non-instructional materials for general audiences. After a review of the history, purposes, and text-based nature of formulas, this paper presents alternatives to the use of formulas--alternatives which are more reader-based and, thus, more consistent with current definitions of the reading process.

Assessing Readability: Formulas and Alternatives

Teachers, curriculum committees, librarians, writers, and editors are influenced by the scores yielded by readability formulas. Readability scores are used to determine the grade- level appropriateness of materials ranging from library books and periodicals, to instructional materials in subjects such as social studies, science, mathematics, health, and even reading. At least some of these uses are not appropriate.

It would be difficult to find an authority in the field of reading and language arts who would fail to assert that reading involves interaction between the reader and the text. In fact, reading research supports the common wisdom that readers use their knowledge and experience during the comprehension process (Johnston, 1983).

Readability formulas, being strictly text based, do not reflect the interactive nature of the reading process. Popular formulas employ only a syntactic

(sentence length) and a semantic factor (vocabulary diversity). Formulas do not directly address factors related to the communication of meaning, and as Dreyer (1984) notes, cannot discriminate between written discourse and nonsensical combinations of words. Moreover, formulas are not capable of addressing reader-related factors--interest, experience, knowledge, and motivation.

The following section discusses the characteristics of several popular readability formulas: the Dale-Chall (1948), the Fry Graph (1977), and the Spache (1974). Subsequent sections describe text-based and reader/text-based alternatives to formulas. Finally, appropriate applications of each form of readability assessment are discussed.

Popular Readability Formulas

Readability formulas are objective, quantitative tools for estimating the difficulty of written material without requiring the testing of readers. Texts involving a wide range of content and prose styles may be assessed through the use of formulas.

Formulas stem from interest in matching reader ability and text difficulty. Educators, such as Lorge

(1939) and Dale and Chall (1948), developed formulas in order to determine if reading materials were suited for readers of given levels of ability. Other formula developers, such as Flesch (1948) and Gunning (1952), worked as writers. Their main concern was with the evaluation of writing in progress, to see if it matched the assumed reading skills of an intended audience.

Examination of the history of readability formulas reveals simiarities in their standardization (Klare, 1963) and, that some popular formulas may have faulty standards. Stevens (1980) observed that the Lorge and Dale-Chall formulas are based on the McCall-Crabbs Standard Test Lessons in Reading--materials which were not intended for or standardized for this purpose. Dreyer (1984) questioned whether the grade level scores they yield are related to an acceptable standard of reading competence for a given grade in school. For example, the grade level indicated by the Dale-Chall formula implies that readers should be able to correctly answer one-half to three-fourths of comprehension and vocabulary knowledge questions on the text being examined (Dale and Chall, 1948). Fiftieth percentile comprehension may be marginally acceptable for instructional reading. It is not acceptable for

independent reading.

Users of any readability formula should know its characteristics--the aspects of reading, such as word and sentence length, it uses in its assessments; the level for which the formula was intended; and especially, the accuracy with which it predicts.

As are most widely-used readability formulas, the formulas discussed here are two factor measures. Each requires the user to select a small number of sample passages from the text to be analyzed.

Each method involves analysis based on a syntactic and a semantic variable. The Spache and the Dale-Chall formulas use sentence length (syntactic variable) and numbers of hard words (semantic variable). The Fry Graph employs sentence length and number of syllables per 100 words.

The Spache formula is meant for use in primary grades only. The Dale-Chall formula can be used from grade four up. The Fry Graph estimates readability from grade one through the college level.

It is necessary, in using the Dale-Chall and Spache formulas, to count the number of words in the text sample which do not appear on lists of easy words (3000 - Dale-Chall; 1041 - Spache). The difficulty of

using these formulas is, therefore, greatly reduced through the use of computer programs which count "hard" words quickly.

The Fry Graph, does not require the user to manipulate an equation or to count "hard" words. It involves only a count of syllables, a count of sentences in a series of one hundred-word samples, and simple computations of numbers which can be plotted on the graph. It is a convenient method for those who must work without the aid of computers.

Formula accuracy should be a central concern of users. The accuracy of the Fry Graph at the primary level is probably not adequate. At that level, it provides, according to Fry (1977), estimates within a year of grade level. At the same level, the Spache formula--designed for use in the primary grades--claims accuracy to within 3.3 months.

For materials intended for use above the primary level, the accuracy of the Fry Graph is similar to that of the Dale-Chall Formula. It should be noted, however, that while the Dale-Chall may consistently overestimate difficulty, the Fry may consistently yield underestimates. Guidry and Knight (1976) have suggested adjustment factors of -0.891 for the

Dale-Chall and +0.865 for the Fry. They found, in an analysis of Newbery Award winning books, that subtracting .891 from a Dale-Chall derived readability score or adding .865 to a Fry score yielded truer estimates of text difficulty.

The notion that no formula yields an exact readability level, has been supported by Fitzgerald (1980, 1981) who repoıted great variation in formula scores due to sampling methods. Her studies suggest that formulas may yield unreliable estimates when small numbers of samples are used. She observed that reliable estimates of readability are, in many cases, obtainable only when the samples include the entire text. That is, in Fitzgerald's view, sampling methods should involve continuous 100 word passages from the beginning to the end of he book being examined.

Readability formulas are useful tools for obtaining estimates of the difficulty of text, when the intended audience for that text is known only in general terms. For example, librarians, editors, and writers should find formulas valuable when selecting or preparing materials for hypothetical group such as, "typical" fifth-grade-level readers. When, however, the intended

audience is composed of readers whose interests, experience, training, knowledge, motivation, and skills are known--or when the materials will be used instructionally--the value of formulas is diminished.

Alternative Methods

Alternatives to readability formulas fit into two categories--text-based (like the formulas) and reader/text-based. Both types of alternatives allow the user to focus attention on factors involved in comprehension.

Text-Based Alternative

A recently developed text-based method of analysis has the advantage of involving meaning in the estimation of readability. Phrase analysis (PHAN) described by Clark (1980) is a straightforward method which employs the linguist's tool of propositional analysis to determine the coherence of text passages. That is, the system enables the user to examine the clarity of relationships between ideas within the text. The present writer's experience using PHAN in college classrooms indicates that teachers become efficient in the use of Clark's system after one or two trial

applications.

Reader/Text-Based Alternatives

The least complex and most specific method of determining if a text is appropriate for a reader or group of readers, involves trial reading. A reader for whom a book is being selected, is asked to read aloud from the text. If the book is to be used by a group of readers, several average readers are asked to read samples of the text. The appropriateness of the text can be evaluated according to the following criteria:

Independent level -- 99% word accuracy (90% comprehension)

Instructional level -- 95% word accuracy (75% comprehension)

Frustration level -- 90% word accuracy (50% comprehension)

There is some disagreement among experts concerning the exact limits of these levels. Harris and Sipay (1981), for example, allow two or three unknown words at the independent level. Generally, however, the above levels are acceptable.

A second reader/text based alternative to the use

of readability formulas is teacher judgement. This approach is direct and highly reliable; Dale and Chall (1948) and others (Klare, 1963) have reported that the judgements of panels of teachers correlated on the order of .90 with formula scores. This method is probably best for experienced teachers who are familiar with reading materials at several grade levels. Some important considerations in judging difficulty of texts are:

1. Does the text include difficult vocabulary?
2. Are difficult ideas or concepts included?
3. Are sentences unusually complex or simple?
4. Are relationships between concepts or events clearly stated?

(A weakness of passages written in short sentences is that such passages frequently omit key relationship words i.e., <u>because, thus, therefore.)</u>

5. Does the text require the interpretation of graphics, such as pictures, charts, tables, and diagrams?

Consideration of these factors should help maintain high reliability in teacher estimates of readability.

The third reader/text-based means of estimating

readability involves the cloze procedure (Taylor, 1953). The term, cloze, may be thought of as being related to the word, closure. It involves filling in blanks in a text, and may be used in evaluating materials for individuals or for groups. In order to develop a cloze measure of readability:

1. Delete every fifth word in a selection
2. a) Ask the individual reader to read the passage silently and fill in each blank with the word that seems to belong in that blank
   b) Ask average readers at a given level to read a passage silently and fill in each blank.

Scoring is based on the percentage of words, filled in by the reader, that match the original text exactly:

Less than 45% correct equals the frustration level.

Forty-five percent to 57% equals the instructional level.

Greater than 57% equals the independent level.

The performance of several average readers from a group will indicate how readable the text will be to the group as whole.

A most systematic and comprehensive reader/text-based method of estimating the appropriateness of texts for readers is the Readability Checklist (Irwin and Davis, 1980). The checklist does not directly involve readers in reading a passage, but requires the user to consider the match between reader and text characteristics. Factors of instructional importance are arranged in two categories, understandability, and learnability.

The understandability section of the scale, requires the user to consider the relationship between the information in the text and the reader's prior knowledge; the clarity with which concepts are developed in the text; and the incidence of factors which confuse readers--irrelevant detail, absence of explicitly stated connecting words, such as because, although, before, and therefore. In examining the learnability of the text, the scale focuses the user on organizational, reinforcement, and motivational factors.

The Irwin-Davis Readability Checklist enables systematic, meaning-oriented examination of a text. Importantly, the checklist involves consideration of

factors which are both reader-related and text-related. The checklist requires evaluation of written material in light of knowledge about readers.

When To Use Formulas and Alternative Methods

Formulas are useful tools for obtaining "ballpark" estimates of readability. They are most useful when there is a need to determine the readability of texts, such as library books and periodicals, which will be read independently. They are not appropriate when the need exists to match a text to a specific reader or group of readers.

Formulas may be misused when thet are applied to instructional materials. In such applications, formulas should be expected to consistently predict that instructional materials will be too difficult for given grade levels. Science, social studies, and other subjects require the use of specialized, technical vocabulary. The occurence of such vocabulary artificially increases the number of "hard" (unfamiliar) words, thus inflating readability scores. Because these words are taught during classroom lessons, they should not be considered "hard."

It seems likely that a good many published

instructional programs have been rejected by school personnel, or unnecessarily revised by authors who misused or misinterpreted readability formula scores. One plausible explanation for the choppy, short-sentence style in which many elementary school science and social studies textbooks are written, is that authors compensate for "hard" words by shortening sentences thus, assuring appropriate readability scores. The "catch 22" of this practice is that clarifying connectives (words like, because, therefore, and thus) are often deleted in order to shorten sentences. As Irwin and Davis (1980) point out, deletion of such "relationship words" often makes text more difficult to comprehend. Similarly, Pearson (1974) has shown that shortening sentences does not necessarily make text easier to read.

Readability formulas are useful in matching reading materials to general audiences of some assumed level of reading ability. Formulas, however, are not always appropriate tools for matching texts to readers. The alternatives to formulas, suggested here, are appropriate when texts are being matched to known readers. The key implication of this paper is that

those concerned with instruction--of groups or individuals--should rarely turn to readability formulas. Rather, educators and other users should ply their knowledge of individual reading abilities and text-characteristics to plan successful reading experiences.

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